CLAIMS

Therefore, having thus described the invention, at least the following is claimed:

1. A method for recognizing a road sign in a digital color image, where the road sign is associated with a shape template and at least one color criterion, the method comprising:

capturing a digital color image;

correlating at least one region of interest within the digital color image with a template matrix, where the template matrix is specific to a reference sign; and

recognizing the image as containing the reference sign, responsive to the correlating step.

2. The method of claim 1, further comprising:

performing color segmentation on the digital color image to produce at least one matrix;

extracting at least one region of interest from the matrix to produce at least one submatrix containing at least one potential road sign;

correlating the at least one submatrix with a template matrix to produce a correlation coefficient, where the reference matrix is specific to a reference sign; and

recognizing the image as containing the reference sign, based upon a comparison of the correlation coefficient and a correlation threshold value.

3. The method of claim 1, wherein the performing step further comprises:

setting each element of the matrix to a first value if the corresponding pixel position in the digital color image matches any of the at least one color criterion associated with the road sign.

4. The method of claim 1, wherein the at least one color criterion comprises:

a first color selected from R,G,B being greater than a first threshold value; and

a saturation value for the first color being greater than a second threshold value, where the saturation value is calculated using a hue, saturation and intensity model.

5. The method of claim 4, wherein the at least one color criterion is locally adaptive such that the first threshold value varies at each location within the matrix.

6. The method of claim 5, wherein the first threshold value at a location X(i,j) is the average of a square submatrix centered at X(i,j).

7. The method of claim 1, further comprising a second color criterion, where the first criterion is used in dim light conditions and the second criterion is used in bright light conditions.

8. The method of claim 7, wherein the second color criterion comprises:

a second color selected from R,G,B being greater than a third threshold value; and

a saturation value for the second color being greater than a fourth threshold value, where the saturation value is calculated using a hue, saturation and intensity model.The method of claim 1, where the matrix contains only binary values.

9. The method of claim 1, where the matrix contains only binary values.

10. The method of claim 1, further comprising:

recursively removing any invalid row and any invalid column from the matrix, where an invalid row contains less than a first threshold value of a binary value and an invalid column contains less than a second threshold value of the binary value.

11. The method of claim 1, where the correlating step further comprises:

creating a validating column vector corresponding to all columns in the submatrix;

creating a validating row vector corresponding to all rows in the submatrix;

correlating the validating column vector with a template column vector; and

correlating the validating row vector with a template row vector.

12. The method of claim 1, where the correlating step further comprises:

normalizing the submatrix, such that each element in the normalized submatrix is the weighted sum of the element's four neighboring elements.

13. The method of claim 1, where the correlating step further comprises calculating a two-dimensional correlation coefficient which measures the correlation between the submatrix and a two-dimensional template matrix.

14. The method of claim 1, where the correlating step further comprises calculating a two-dimensional correlation coefficient which measures the correlation between the submatrix and a two-dimensional template matrix.

15. The method of claim 1, where the extracting step further comprises:

scanning the matrix for a element with value 1 at position E(x,y); and

performing a depth-first-search to find all elements with value 1 that are connected to E(x,y);

16. The method of claim 15, where the extracting step further comprises:

setting the element at position E(x,y) to a unique identifier; and

setting the value of the connected elements to the unique identifier.

17. A computer readable medium having a computer program for recognizing a road sign in a digital color image, where the road sign is associated with a shape template and at least one color criterion, comprising:

logic configured to capture a digital color image;

logic correlate at least one region of interest within the digital color image with a template matrix, where the template matrix is specific to a reference sign; and

logic configured to recognize the image as containing the reference sign, responsive to the correlation logic.

18. A system for recognizing a road sign in a digital color image, where the road sign is associated with a shape template and at least one color criterion, the method comprising:

means for capturing a digital color image;

means for correlating at least one region of interest within the digital color image with a template matrix, where the reference matrix is specific to a reference sign; and

means for recognizing the image as containing the reference sign, responsive to the correlation means.